(No Model.)

C. CUTTRISS.

TELEGRAPHIC RELAY.

No. 475,441. Patented May 24, 1892.

Fig. 1

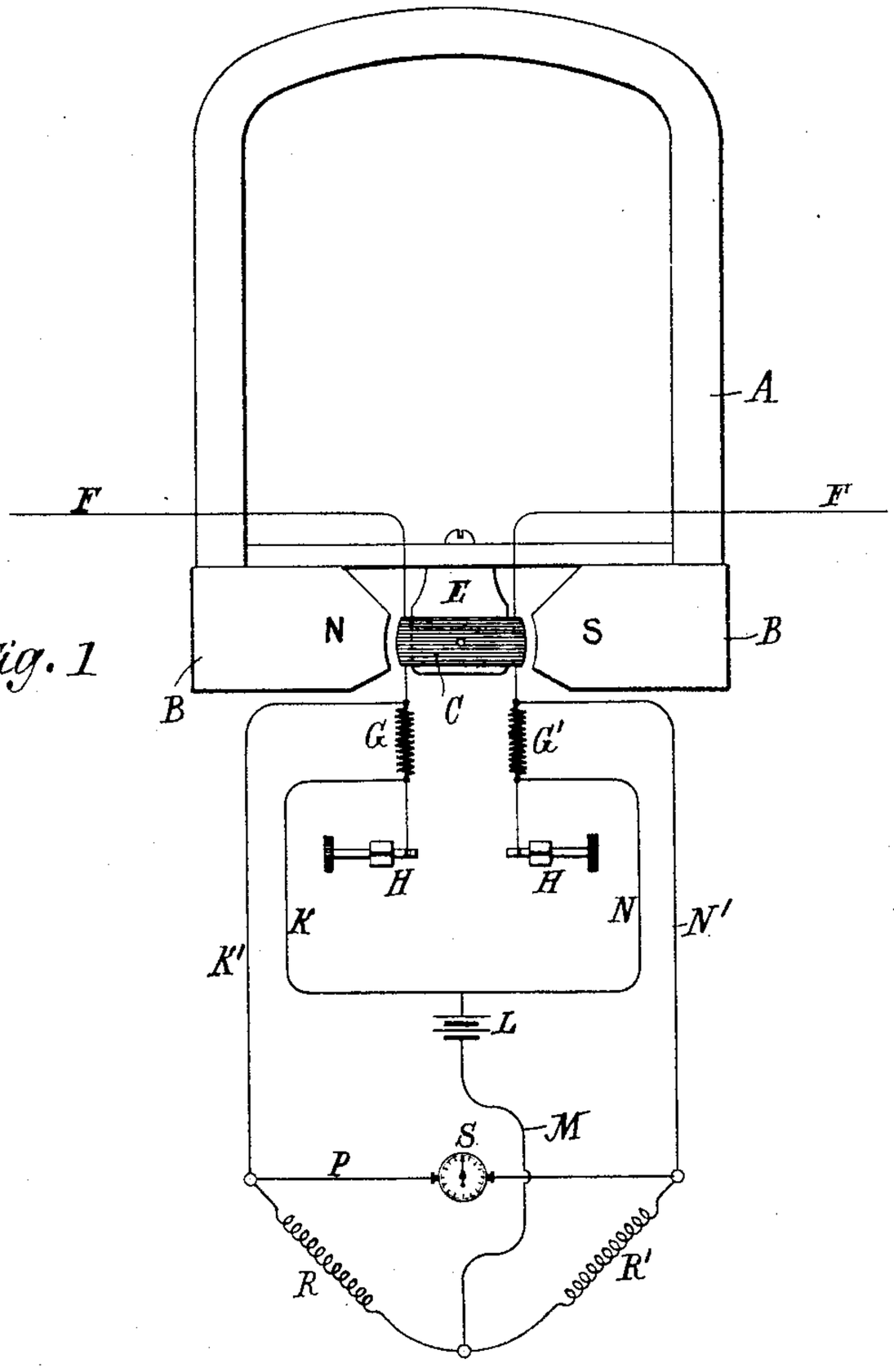
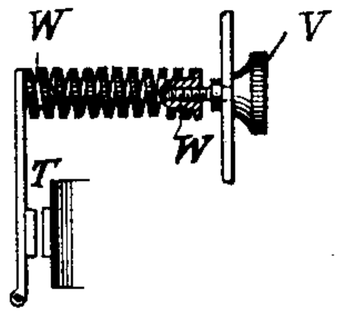


Fig. 2



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CHARLES CUTTRISS, OF NEW YORK, N. Y.

TELEGRAPHIC RELAY.

SPECIFICATION forming part of Letters Patent No. 475,441, dated May 24, 1892.

Application filed December 1, 1891. Serial No. 413,705. (No model.)

To all whom it may concern:

Be it known that I, CHARLES CUTTRISS, a subject of the Queen of Great Britain, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Telegraphic Relays, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

This invention is primarily an improvement in relay-instruments of that class which in response to impulses of current over a line with which they are or may be connected produce in a local circuit or in branches of the same a variation of electrical resistance as distinguished from an actual make and break and by such means control the amount of current flowing through a suitable receiving-instrument.

The invention involves a device which may be regarded as a rheostat, and which consists of an attenuated resilient body in the form of a wire or strip, preferably of a resistant material, such as carbon, and which is bent or wound upon itself so that different parts or convolutions may lie in the same lines or planes, such as in the case of a solenoid, volute, or spiral. In practice a true spiral form is preferred, so that as the wire or strip is distended or compressed different parts of its convolutions or spires will be drawn out of or forced into contact to a greater or less extent, depending upon the degree of distention or compression. Such a device included in an electric circuit between a fixed point of resistance and a body movable in response to electric or other waves or impulses may be utilized to vary the resistance of such circuit for the control of a relay-instrument or for other purposes, and constitutes for such purpose a most sensitive and delicate instrument well adapted for use in telephones, cable-relays, and the like, for in such applications the vibrating diaphragm or oscillating armature or coil may be caused to distend or compress the spiral to a sufficient extent to produce marked variations in its total electrical resistance without encountering any sensible opposition or resistance to movement.

In an application filed by me July 22, 1891, Serial No. 400,279, I have shown and described one form of the above-described rheostat as applied to telephones in which a vibrating diaphragm is employed. My present application, however, is based upon the said rheostat broadly as a means for varying the resistance of a circuit when great delicacy of adjustment and action is required and also for its particular application to a relay for use with submarine cables.

In the accompanying drawings, Figure 1 is a plan view, partly diagrammatic, of a cable-relay embodying my improvements. Fig. 2 is an enlarged view of the rheostat or variable resistance detached and in a modified form.

A designates a permanent magnet provided with concentrating pole-pieces B, between which a coil of fine wire C is suspended by the usual torsional or similar supports. The normal position of the coil is that shown in which the convolutions lie in planes parallel to the lines of the field of force created by the magnet.

D is a non-magnetic bar that supports a magnetic block or core E, that extends between the convolutions of the coil and the poles of the magnet A for the purpose of concentrating the lines of force.

The coil C is connected with the cable or signaling line of conductors F, and a current impulse or rise of potential in such line tends to turn said coil out of parallelism with the magnetic lines. Such deflections in one direction or the other, according to the direction of the current, are employed to operate the relay-instrument in the following manner:

To each side of the coil A is connected by a fiber one end of a carbon spiral G G′. The opposite ends of these spirals are connected in a similar manner with adjusting stops or screws H, by means of which the tension of the spiral may be adjusted. The spiral G is connected electrically by a wire K with one of the poles of a local battery L, and the other end is connected with the opposite pole of the battery through a wire K′, an adjustable resistance R, and a wire M. The spiral G′ has one end connected to the battery L by wire N and the other end to the opposite pole of the same by wire N′, adjustable resistance R′, and wire M. The spiral or strip is attenuated or slender, so as to oppose as little re-

sistance as possible to the motion of the body that distends and compresses it.

The receiving-instrument S is connected up in a bridge between the wires K′ and N′. In the operation or use of this instrument a rise of potential on the main line will deflect the coil C in a direction, say, to distend the spiral G and permit a closer contact of the spirals of G′. The resistance of the branch of the local circuit, including the spiral G, the wire K′, and resistance R, will therefore be considerably increased, while the resistance of the other and corresponding branch will be reduced so that the previously-adjusted balance on the bridge P being disturbed current will flow through the same from N′ to the battery through resistance R. The opposite effect will obviously be produced by a line-current of opposite direction, and the receiving-instrument, of whatever character it may be, will respond immediately to all impulses or variations of potential on the main line.

In lieu of the suspended or pivotal coil C, an armature or bar actuated by an electro-magnet may be employed. This is indicated in Fig. 2, in which T designates an armature and V an adjustable support. In such cases it is desirable to attach buttons or studs W to both the armature and the adjustable support, which enter the ends of the carbon spiral and are secured thereto. The main feature which distinguishes this rheostat or variable resistance device from the solid carbon buttons or the cushion-electrodes composed of agglomerated pieces or particles of conducting material heretofore used in such instruments is that by the movement imparted to it the extent as well as character of superficial contact is varied, and such variation is attended by a true short-circuiting of the intermediate conductor gradual in character. A further feature and one of importance is that the movement of one part of the conductor with respect to another is effected with little or no opposition.

It is evident, since the function of the fixed or stationary support for the spiral, aside from its capability of adjustment, is merely to oppose the movement of the coil or equivalent moving part, that when such means for securing greater range of movement as two coils or the like moved in opposite directions by the same electric or other impulse is employed the ends of the spiral may be connected to the two coils, respectively, and the stationary support becomes an imaginary point.

Having now described the invention, what I claim is—

1. A sensitive rheostat or device for varying the resistance of an electric circuit, composed of an attenuated resilient resistant conducting-strip included in the circuit to be varied and wound or bent in symmetrical convolutions or spires, in combination with a stationary support and a body movable in response to current or other waves, the ends of said conducting-strip being respectively connected to the stationary support and movable body, as set forth.

2. The combination, with a device, such as a coil, adapted to be moved in response to current waves or impulses in an electric circuit, of a local circuit, a receiving-instrument therein, and one or more attenuated resilient resistant conductors included in the local circuit and connected to the said coil and to a stationary support, respectively, said strip being bent or wound in spiral form, as herein set forth.

3. A relay-instrument comprising, in combination, a coil or device to be moved by currents in the main line, and a carbon strip wound spirally upon itself and adapted to be distended or compressed by the moving coil and included in the local circuit for varying the resistance in the same, as set forth.

4. The combination, with a coil movable in response to currents in a main circuit, of a divided local circuit, a distensible carbon spiral in each branch of the same, connected with the movable coil on opposite sides of the axis of the same, and a receiving-instrument in a bridge between the divisions of the local circuit.

5. In a relay-instrument, the combination, with a permanent magnet and a suspended coil movable on an axis between the poles of said magnet, of two spirally-wound carbon strips connected at opposite ends to adjustable supports and to the coils on opposite sides of its axis, respectively, and included in branches of a local circuit, and a receiving-instrument in a bridge between the same, as set forth.

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